

**We Claim:**

1        ~~1.~~ A nonlinear crystal used for mixing of optical signals, the  
2 nonlinear crystal comprising:  
3        a plurality of domains, the domains being arranged serially across  
4 the nonlinear crystal, the domains having alternating polarity; and,  
5        wherein the poling periods of the domains are varied across the  
6 nonlinear crystal so as to provide nonuniform chirping of phase matching of  
7 focused optical signals propagated through the nonlinear crystal.

1           2. A nonlinear crystal as in claim 1 wherein the nonlinear crystal is  
2   composed of periodically poled lithium niobate (PPLN).

3. A nonlinear crystal as in claim 1 wherein a chirp slope is steeper near a center of the non-linear crystal and shallower towards end facets of the non-linear crystal.

1           4. A nonlinear crystal as in claim 1, wherein the poling periods of the  
2 domains are varied across the nonlinear crystal so as to provide nonlinear  
3 chirping of phase matching of the focused optical signals propagated  
4 through the nonlinear crystal.

1           5. A nonlinear crystal as in claim 1, wherein the poling periods of the  
2 domains are varied across the nonlinear crystal so as to provide piecewise

3 linear chirping of phase matching of the focused optical signals propagated  
4 through the nonlinear crystal.

1 6. A nonlinear crystal as in claim 1 wherein the focused optical  
2 signals comprise:

3 a first focused optical signal; and,

4 a second focused optical signal, the second focused optical signal  
5 being an optical strobe signal.

1 7. A nonlinear crystal as in claim 1 wherein nonlinear crystal is  
2 within an optical sampling digital oscilloscope.

1 8. A method for increasing spectral acceptance within a nonlinear  
2 crystal, the method comprising the following steps:

3 (a) arranging the nonlinear crystal as a plurality of domains, the  
4 plurality of domains having alternating polarity as the domains are  
5 traversed serially across the nonlinear crystal; and,

6 (b) varying the poling periods of the domains across the nonlinear  
7 crystal so as to provide nonuniform chirping of phase matching of focused  
8 optical signals propagated through the nonlinear crystal.

1 9. A method as in claim 8 wherein in step (a) the nonlinear crystal is  
2 composed of periodically poled lithium niobate (PPLN).

1           10. A method as in claim 8 wherein in step (b) a chirp slope is steeper  
2 near a center of the non-linear crystal and shallower towards end facets of  
3 the non-linear crystal.

1           11. A method as in claim 8, wherein in step (b) the poling periods of  
2 the domains are varied across the nonlinear crystal so as to provide  
3 nonlinear chirping of phase matching of the focused optical signals  
4 propagated through the nonlinear crystal.

1           12. A method as in claim 8, wherein in step (b) the poling periods of  
2 the domains are varied across the nonlinear crystal so as to provide  
3 piecewise linear chirping of phase matching of the focused optical signals  
4 propagated through the nonlinear crystal.

1           13. A nonlinear crystal with increased spectral acceptance, the  
2 nonlinear crystal comprising:  
3           a plurality of domains, the domains being arranged serially across  
4 the nonlinear crystal, the domains having alternating polarity; and,  
5           wherein the poling periods of the domains are varied across the  
6 nonlinear crystal so as to provide nonuniform chirping of phase matching of  
7 focused optical signals propagated through the nonlinear crystal.

1           14. A nonlinear crystal as in claim 13, wherein the nonlinear crystal  
2 is composed of periodically poled lithium niobate (PPLN).

1           16. A nonlinear crystal as in claim 13, wherein the poling periods of  
2   the domains are varied across the nonlinear crystal so as to provide  
3   nonlinear chirping of phase matching of the focused optical signals  
4   propagated through the nonlinear crystal.

1            17. A nonlinear crystal as in claim 13, wherein the poling periods of  
2    the domains are varied across the nonlinear crystal so as to provide  
3    piecewise linear chirping of phase matching of the focused optical signals  
4    propagated through the nonlinear crystal.

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